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(54) Security marking

(57) In apparatus for the provision of markings on a material surface a laser production unit 20 is provided to be movable in relation to a control unit 16 to allow the laser production unit to move in relation to or along with the material to which the marking is to be applied by laser. The apparatus is particularly suitable for security marking of vehicle windows during production.

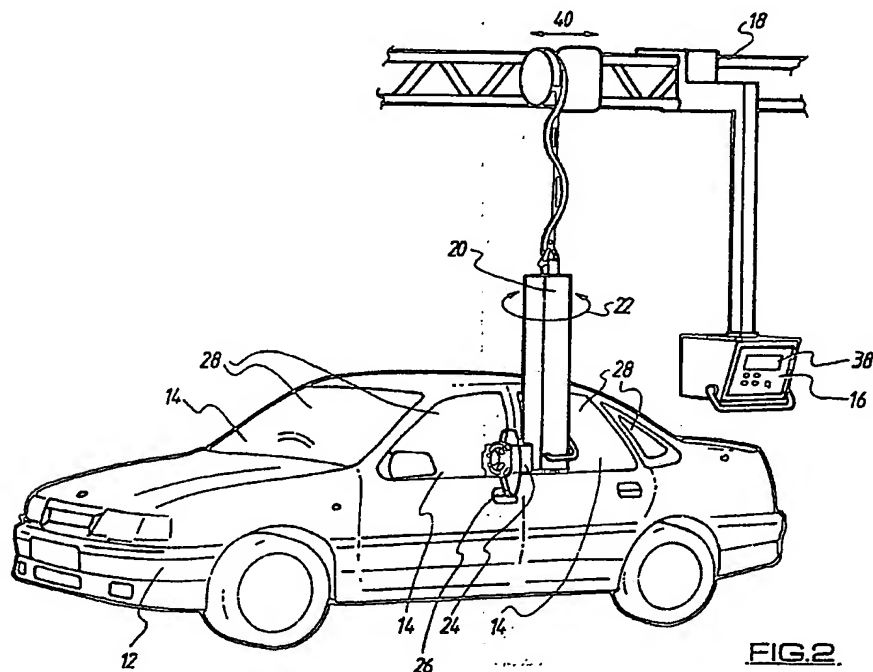
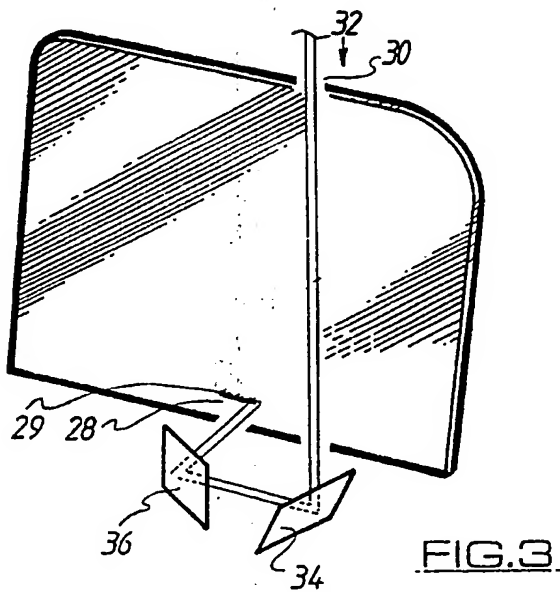
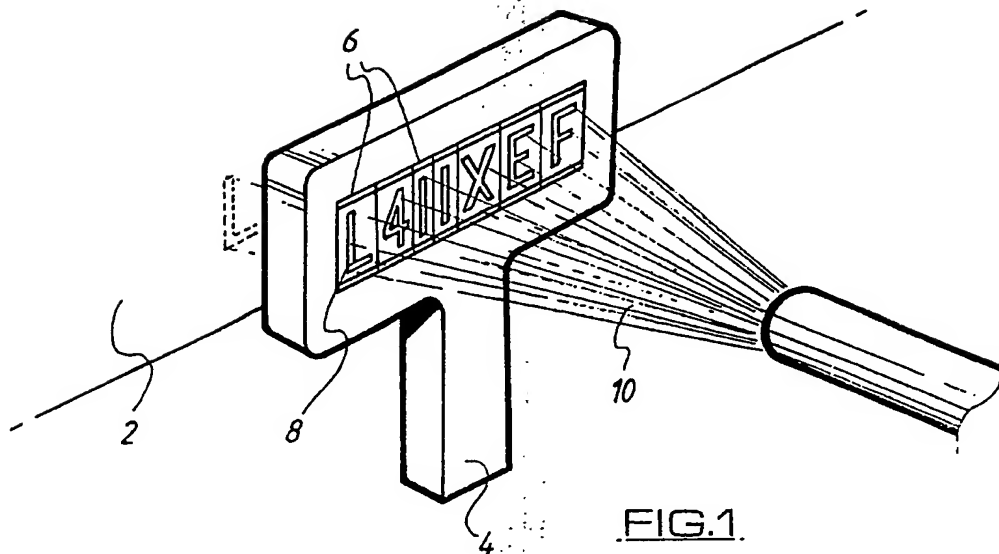


FIG. 2

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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Improvements Relating to Security Marking of Material Surfaces

This patent application relates to improvements in the marking of material surfaces such as glass windows and typically, but not exclusively, to the marking of windows fitted to vehicles. The improvements relate both to the method of obtaining the marking on the window and also to the mounting of said marking apparatus such that the marking system can be an integral part of a vehicle assembly process.

At present, there is an increasing demand for security measures to be provided to counteract the increasing prevalence of theft of motor vehicles. One such measure which is deemed to reduce the risk of theft of a vehicle is the marking on the vehicle windows of a security code. At present the security code is typically the registration number of the vehicle and the said code is thus etched on each of the windows of the vehicle.

At present said security codes are applied to the window by one of two methods. The first and most commonly used method is by a blast etching process wherein aluminium oxide particles of roughly 100 to 200 mesh size are blasted at high power against the window, through a stencil in which the security code is represented. The abrasion caused by the blasting of the particles subsequently causes the security code of the stencil to be produced on the glass window. The second of said processes again involves a stencil however instead of a blast of particles being applied through the stencil; chemical etching is used whereby a chemical is applied through the stencil onto the window and left for a period of time so that the window is etched with the security code once the chemicals have reacted with the glass.

Both of these systems are currently applied to the vehicle

window at the stage where the vehicles are in car showrooms for a number of reasons. The first reason is that the systems are manually performed and require the stencil to be altered for every security code. To change the stencil requires the letters and numerals to be replaced and refitted to suit the registration number of the vehicle and hence, while the system is easily used in "one off" circumstances the systems are not suited to repetitive and fast moving assembly operations. Secondly, there is the problem that when the vehicles arrive at the car dealers they do not have a car registration number which means that it is necessary to wait until the car is at the dealership and is allocated a registration number until the security code can be applied. There are several disadvantages related to use of the currently available systems as the stencils, after prolonged use, are found to wear out and hence the security code obtained on the window is not clear. Furthermore the requirement to change stencils upon each use thereof means that breakages can occur in the stencils and it is also found that certain letters and numbers are used more frequently than others and hence uneven wear of certain of the numbers and letters occurs. Finally it is a disadvantage that due to the nature of blast etching and also chemical etching, it is difficult to contain the medium used for the etching process within a designated area. This is particularly problematic in any area where a dust free environment is required.

For these reasons the above systems are recognized as not being suitable for use in vehicle assembly lines which would, if possible, be the most desirable area for affixing the number. Recent developments in the government approach to car security has forced manufacturers to consider security methods in more detail. It is also the case that the car manufacturers may be forced by legislation to apply to the

windows of vehicles a Vehicle Identification Number (VIN). It is envisaged that the said VIN will be a combination of the manufacturers code, the model code and the particular vehicle code resulting in a number of perhaps 17 alphanumeric digits. This potentially allows the car manufacturer to place said VIN on the vehicle windows during the assembly stage as it is not linked to the vehicle registration number. Furthermore it is envisaged that the said VIN's will be held on a central government computer which will hold records of all of the codes and the owners thereof. While this allows the VIN to be applied to the windows of a vehicle during the assembly process the etching application systems so described above are not suited due to the disadvantages listed above and also the fact that the stencils to be used, in order to facilitate 17 alphanumeric digits, would be very large, unwieldy and the changing of same for each vehicle would be time consuming.

It is the aim of the present invention to provide a system for the application of markings in configurations such as logos, numbers or alphanumeric codes such as vehicle identification numbers, or security codes, to material surfaces such as windows of vehicles on an assembly line such that the application process is an integral part of the assembly of the vehicle and requires a minimum of manual operation of the process. Furthermore it is an aim of the invention to provide a laser etching means for the application of said marking to the windows and for the said laser application means be mounted on movable supports.

The present invention provides a system for the application of markings onto a surface by laser means said apparatus incorporating at least one laser production unit and a control unit, said control unit including means for the input of the configuration of the marking to be reproduced and controlling the path of the laser production unit to

reproduce the marking on contact of the laser beam with a material and wherein said laser production unit is movably mounted in a position remote from the control unit therefore.

Preferably said laser beam will be a CO² beam produced from the laser production unit incorporating a closed loop refrigerant system.

Typically the matter to be applied to the surface will be produced by a vector scanning system which will be computer controlled and pre-programmed with said laser moving from a first vector point to a second vector point and third and thereon until the matter is complete. Alternatively said matter will be produced by a raster scanning system which again will be computer controlled and preprogrammed.

In a further aspect of the invention the matter to be applied to the surface material will be a vehicle identification number and the said material will be the glass windows of a motor vehicle.

Preferably said laser production unit and application unit will be rotatably mounted on an overhead gantry.

Typically in a vehicle assembly line there will be provided two of said laser beam production units both rotatably mounted, one at each side of the vehicle and each of said production units will be capable of movement such as to apply said vehicle identification number to each of one set of side windows and the front window and the other unit will apply the vehicle identification number to each of the other set of side windows and the rear window.

Preferably said control unit will be mounted remote to the two laser production units and will have therein a screen to

identify to the operator the vehicle identification number to be applied to each of said windows.

The laser production units will be movable in the same direction as movement of the vehicle as it passes along the vehicle assembly line thereby ensuring that the said vehicle identification number can be applied to the windows while the vehicle moves along the assembly line. This will ensure that vehicle assembly times are not adversely affected by the application of the vehicle identification number.

In a further aspect of the invention the vehicle identification number to be applied to a particular vehicle will be determined by a bar code placed on each of the vehicle production sheets. Typically said vehicle production sheets pass with the vehicle through each of the vehicle assembly stages.

The remote control unit will therefore be linked to a bar code reader by which the operator can read the bar code on the relevant production sheet and the remote control unit will hence identify the vehicle identification number to be applied and this number will subsequently be applied by laser to the vehicle window.

Typically the laser production head will be fitted with sensors which will sense the said application head coming into contact with the glass and will then proceed with the application of the vehicle identification number to the window.

In addition to the application of the said vehicle identification number will be also possible to apply other matter by laser i.e. apply the logo or crest of the car manufacturer in conjunction with the vehicle identification

number or to apply whichever other additional codes or information is deemed necessary by the manufacturer, legislation, or the end purchaser.

In a further embodiment of the invention the laser beam produced in the production unit is passed onto the window by means of at least one reflective means mounted at an angle in relation to the laser beam to ensure that the said laser beam is applied to the window at the required angle to ensure accurate and clearly defined reproduction of the marking.

A specific embodiment of the invention will now be described with reference to the accompanying drawings, wherein;

Figure 1 shows a conventional method of application of a security code to a vehicle window

Figure 2 shows a perspective view of a security code to vehicle windows, and

Figure 3 shows in diagrammatic form the system of application for the security code.

Referring firstly to Figure 1 there is shown the conventional method of application of a security code to a surface such as a vehicle window 2 the said etching system comprising a stencil holder 4 which has fitted therein a series of stencil parts of alphanumerical characters 6. The said characters 6 have apertures 8 such that upon the completion of the etching process the image of these apertures is reproduced on the window 2. Typically, as in this case, the final image is that of the car registration number. To produce the etching as shown in this figure, a series of particles 10 are blasted at the stencil holder 4 and those particles which pass through the apertures 8 in the stencil parts 6 abrade the

glass surface of the window 2 and hence the car registration number is etched onto the window 2.

Referring now to Figure 2 there is shown the method of application of the invention, wherein there is shown a vehicle 12 with windows 14 upon which the security code is to be applied. The application apparatus of the invention comprises a remote control unit 16 which is mounted on an overhead gantry 18 remote to at least one laser production unit 20 which is rotatably mounted in direction 22 and has an application head 24 which is rotatably mounted in direction 26. Again these are movably mounted on an overhead gantry 18. At least one of said laser production units 20 are provided but typically two will be provided, one on each side of the vehicle 12. The laser production unit is capable of applying the security code to each of the windows 28 by means of a laser beam passing from the laser production unit 20 and onto the window applying thereon the marking in the form for example of a security code or VIN.

Figure 3 shows diagrammatically the application of the marking to the window wherein the laser beam 30 passes in direction 32 to a first mirror 34 mounted in the laser production unit which angles the beam onto a second mirror 36 also within the unit 20 which in turn angles the beam onto the window 28 upon which the marking 29 is applied. The security code here applied is programmed into the remote control unit 16 by means of a bar code reader which will read a bar code placed on the production sheet for each vehicle. This, in turn, allows the security code or vehicle identification number to be identified and hence the specific configuration required for that vehicle is programmed into the control unit which in turn programmes the laser production unit 20 and breaks the configuration code up into a series of vectors such that the said laser beam moves from

each of said designated vectors to reproduce the required configuration vehicle identification marking.

The application method therefore comprises the vehicle arriving along the assembly line at the identification number application stage whereby the operator will, by means of a bar code reader or other means read, read the bar code on the corresponding vehicle production sheet. The vehicle identification number to be applied will then come up on the screen 38 of the remote control unit 16 and the operator will check that this is the required number. The operator will then press the necessary controls to bring the application head 24 and laser production unit 20 to the predesignated start position relative to the vehicle. When the start position is reached, the operator will then press a start button which will start a programmed path for the laser production units 20 and application heads 26 whereby the vehicle identification number will be applied to each of the designated windows 28. In order to maintain the assembly line at the required speed, it will be possible for the laser production units to be movable in direction 40 along the overhead gantry as the vehicle moves along the assembly line thereby ensuring that the application stage so described does not form a bottle neck of the assembly line. When the designated windows have had the necessary markings applied thereto, the laser production unit 20 and application head 26 will return to a stop position withdrawn from the vehicle such that the vehicle can pass onto the next stage of the assembly and a new vehicle will proceed to the marking application station whereby the above process will be repeated for a different vehicle identification number. In one embodiment, the said laser production units 20 have mounted thereon a number of sensors (not shown) which are mounted on the front of the said units such that they will come into contact with the window 28 to which the security

code is to be applied. Once they make contact they will signal to the control unit that the application head is in the correct position and hence the application of the identification number will proceed.

The advantages of this process are considerable in that a vehicle identification number or security code or any other logo or insignia or information can be applied to the vehicle window or any other material surface during the assembly of the vehicle or any other article to which the marking is to be applied during movement. This therefore means that the application process can now be an integral part of the vehicle assembly line thereby minimizing additional assembly time and ensuring that a bottle neck does not occur at this stage. The use of a laser beam to produce the said security code ensures that a dust free environment is maintained and also that the identification number applied to the windows is unobtrusive and yet clearly defined and therefore provides the required security benefits. The system is also largely automated hence increasing the attractiveness of the system to car manufacturers who are increasingly being required to apply said security codes to the windows of their vehicles. Furthermore, as the laser production unit is mounted remote from the control unit and thus the laser is safely used within the production line thereby minimizing the risk of danger to the operator of the device as they are allowed to operate the device remote from the actual laser beam.

CLAIMS

1. Apparatus for the application of markings onto a surface, by laser means, said apparatus incorporating at least one laser producing unit and a control unit, said control unit including means for the input of the configuration of the marking to be reproduced and controlling the path of the laser producing unit to reproduce the marking on contact of the laser with a material and wherein said laser production unit is movable at a position remote from the control unit.
2. Apparatus as in claim 1 wherein said laser production unit is rotatably mounted on an overhead gantry and for movement therealong.
3. Apparatus as in claim 1 wherein the control unit is linked to a bar code reader to allow the configuration of the marking information to be input by the reading of a bar code.
4. Apparatus as in claim 1 wherein said laser production unit is provided with sensors therein to sense the proximity of the laser unit to the material upon which the marking is to be applied.
5. Apparatus as in any of the preceding claims wherein the control unit includes means to control the path of the laser and said means comprises a vector scanning system with said laser controlled to move from a first point to a second point to a third point and thereon to produce the configuration of marking required.
6. Apparatus as in any of claims 1-4 wherein the control unit includes means to control the path of the laser by a raster scanning means.

7. Apparatus as in any of the preceding claims wherein the laser production unit includes at least one reflective means said laser beam directed on to said reflective means to allow alteration of the path of the laser beam on to the material upon which the marking is to be applied.

8. A reflective means as in claim 7 wherein the angle between the reflective means relative to the direction of the laser beam is adjustable by alteration of either or both of the laser beam and the reflective means.

9. Apparatus as in any of the preceding claims wherein the apparatus is used for the production of markings on the bodies of motor vehicles.

10. Apparatus as in claim 9 wherein the marking is applied to any of the glass windows of a motor vehicle.

11. Apparatus as in claim 9 wherein the laser production unit is mounted for movement at the same speed as; and to move along a portion of; an automated vehicle assembly line.

12. Apparatus as in any of claims 9-11 wherein the apparatus comprises two laser production units both mounted for movement parallel with and perpendicular to the vehicle.

13. Apparatus as in claim 12 wherein each of said laser production units is capable of movement such as to apply a marking to at least one side window and one of the rear or front windows of the motor vehicle as the vehicle moves along a driven assembly or repair line.

14. A laser production unit as in any of claims 9-13 wherein the marking applied is a vehicle identification number, each of said vehicles being provided with a unique number.

15. Apparatus as in claim 14 wherein the vehicle identification number is transmitted to the laser production unit from the control unit and relates to a vehicle adjacent the laser production unit.

16. A laser production unit as in claims 14 or 15 wherein further markings can be applied in addition to the vehicle identification number.

17. Apparatus as in claims 9-15 wherein the control unit for the laser production unit is linked in to the control system for the vehicle assembly line.

18. Apparatus as in any of the preceding claims wherein the laser production unit includes means for the production of a CO₂ laser beam.

19. Apparatus as hereinbefore described with reference to the accompanying drawings.

Relevant Technical Fields

- (i) UK Cl (Ed.M) B3V; VLX, VLF, VLC, VLK: B6J
 (ii) Int Cl (Ed.5) B23K

Search Examiner
 D N P BUTTERS

Date of completion of Search
 5 JANUARY 1994

Databases (see below)

- (i) UK Patent Office collections of GB, EP, WO and US patent specifications.

Documents considered relevant following a search in respect of Claims :-
 1-19

(ii)

Categories of documents

- X: Document indicating lack of novelty or of inventive step. P: Document published on or after the declared priority date but before the filing date of the present application.
 Y: Document indicating lack of inventive step if combined with one or more other documents of the same category. E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.
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Category	Identity of document and relevant passages	Relevant to claim(s)
X,P	WO 93/05919 (NORSTAR)	1, 2, 7, 18

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